Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

April 1, 2016

CIRCULAR LETTER 2016-08

FY 2017 LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM

COUNTY ENGINEERS / SUPERINTENDENTS OF HIGHWAYS
MUNICIPAL ENGINEERS / PUBLIC WORKS DIRECTORS / MAYORS
METROPOLITAN PLANNING ORGANIZATIONS – DIRECTORS
TOWNSHIP HIGHWAY COMMISSIONERS
CONSULTING ENGINEERS

The Fixing America's Surface Transportation (FAST) Act continues to place increased emphasis on the reduction of fatalities and serious injuries on all public roads. The Illinois Strategic Highway Safety Plan (SHSP) works to achieve this and outlines a mission to develop, implement, and manage an integrated multi-stakeholder process to improve the attributes of roads, users, and vehicles to reduce traffic-related deaths and life-altering injuries. The Bureau of Safety Programs and Engineering (BSPE) is responsible for oversight and implementation of the SHSP through the Highway Safety Improvement Program (HSIP). As part of this plan, we are requesting local public agency candidate projects for the HSIP that will be initiated in FY 2017.

PROJECTS

The HSIP is a core federal-aid funding program with the goal of achieving a significant reduction in traffic fatalities and serious injuries on all public roads. Both fatalities and serious injuries on the local roadway system continue to represent a significant portion of Illinois' severe traffic crashes and increased emphasis is being placed to address these severe crashes occurring on local roadways. Highway safety projects improve a location or feature, or address a highway safety need that is contributing to severe crashes on the roadway. Specific site (roadway segment and/or intersection) or system-wide improvements that reduce severe crashes are eligible for funding. HSIP funds are limited, and low cost safety improvements are encouraged. Funds may be used to address safety issues independently without completely reconstructing entire roadway segments or intersections to all of the latest policies and standards. Severe crashes associated with roadway departure, intersections, and pedestrians in particular are a priority based on the Illinois SHSP. Strong consideration will be given to specific safety strategies that offer significant benefit to reduction of severe crashes. These include:

1. adding shoulders and/or rumble strips/stripes,
2. enhancing safety performance of curves (advance warning and chevron signing, pavement markings, high friction surface treatment),
3. improving or enhancing signing and pavement markings at intersections,
4. improving signal timing at intersections including installation of flashing yellow arrows (FYA)
5. removing trees within the clear zone,
6. upgrading guardrail and the associated end terminals, and
7. installing more visible crosswalks and signing, pedestrian countdown signals, street lighting and pedestrian refuge islands to address pedestrian safety and injury issues.

The following resources are available and should be used to determine the contributing factors and optimal locations for potential improvement when applying for HSIP funds.

- County Emphasis Area Tables
- County Data Trees and Heat Maps
- Local Five Percent Most Severe Safety Needs List
- Local crash analysis with documented crash data, trends, problem identification and appropriate safety countermeasures.

These tools can assist the local public agency to best select the location(s) and strategies with the most potential to reduce fatalities and serious injuries and to submit as candidates for HSIP funding. Several Safety Engineering Technical Guidance Memorandums are attached to assist with HSIP project applications. Please contact your applicable IDOT District Local Roads office for further assistance and to coordinate HSIP applications.

FUNDING

The anticipated funding level for the local highway system is approximately $45 million for HSIP and will be available in July 2016. The FAST Act does not contain a separate funding set-aside for a High Risk Rural Roads Program (HRRRP). However, rural roadways and the reduction of fatalities and serious injuries are evaluated for performance and continue to be a priority.

The federal funding level is a maximum 90 percent of the total improvement cost for the project with the local public agency responsible for the ten percent matching funds. All phases of a safety improvement project are eligible for this program, including preliminary engineering, design, construction and construction engineering. The required benefit / cost ratio calculation should include all phases for which HSIP funds are requested. The project should be ready to utilize funds in state fiscal year 2017, but multi-year requests will be considered.

A proposed funding schedule, including all phases of the project with the anticipated funding year, must be included with the application. Any later phases of the project, for which funds are requested from future fiscal years, should be clearly indicated on the application. Information regarding local matching funds, or additional funds that will be used to fund each candidate, should also be provided in the application. This will allow the department to effectively program HSIP funds and maximize the selection of safety projects. If a project is selected for funding, the notification letter will indicate for which fiscal year each phase has been approved. Local public agencies are expected to have these funds obligated within two years of the appropriate fiscal year.

APPLICATION PROCESS

Detailed guidelines for the HSIP can be found in the IDOT HSIP policy effective November 1, 2006. This document is not included with this letter, but can be found online at: HSIP Policy: Safety 1-06 under the “Policy” section.

The HSIP website also contains the appendices to the HSIP policy describing the process and requirements to apply for local HSIP funding. Appendix G contains the HSIP Candidate Form (BSE HS1) that is required for application submittals. The Benefit / Cost methodology (in an Excel spreadsheet format) is available under “Analysis Tools.”

EVALUATION

Local public agencies are expected to cooperate with IDOT in evaluating the effectiveness of selected and implemented projects. It is anticipated that IDOT’s BSPE will conduct the detailed evaluation and reporting for selected HSIP projects to the Federal Highway Administration. The local public agency should not assume significant cost for evaluation of the project.

Questions should be directed to your District Local Roads Engineer. IDOT requests an electronic copy of your application (either via e-mail or on a CD) to your IDOT District Bureau of Local Roads and Streets office no later than June 15, 2016. Local public agencies will be notified of their selection by the department.

Sincerely,

Salmon O. Danmole, P.E.
Acting Engineer of Local Roads and Streets

TW/pt

Attachments

cc: Alan Ho, FHWA
Priscilla Tobias, Director Office of Program Development
Roger Driskell, Director Office of Planning and Programming
Paul Loete, Director of Highways Project Implementation
Tim Sheehan, Safety Design Engineer, IDOT BSPE
Eric Seibring, Illinois Association of County Engineers
Joe Schatteman, Illinois Municipal League
Bryan Smith, Township Officials of Illinois
Christine Filbert, Township Highway Commissioners of Illinois

Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

Safety Programs and Engineering Technical Guidance Memorandum

Resources for Highway Safety Improvement Program (HSIP) Applications

March 28, 2016

A variety of tools have been developed to support Highway Safety Improvement Program (HSIP) project development to use the data driven approach to focus limited resources where they will have the greatest opportunity to reduce fatalities and serious injuries. The Illinois Strategic Highway Safety Plan (IL SHSP) identifies safety analysis priorities and the following tools help support implementation of the IL SHSP for state and local roadways. The *Data Trees* and/or *Emphasis Area Tables* can be used first to identify the specific issue within the county or district. *Heat Maps* can be used subsequently to find the specific location(s) throughout the county where appropriate countermeasures may be implemented to help achieve the zero fatality goal identified in the IL SHSP. This document provides additional detail on how to use each of these resources to help direct the statewide safety program.

1. Data Trees

The *Data Trees* should be consulted initially to determine which roadway systems and crash type to analyze. These *Data Trees* will help determine a direct area of focus. The *Data Tree* separates crash data between the interstate, freeway/expressway, other principal arterials, minor arterials, major collectors, and unknown systems. Depending on the jurisdiction and system type of interest, the *Data Tree* branches out into more detail. The primary focus should be on severe crashes from the most recent 5-year period (EX: 2010 through 2014).

A 5-year period is used to give an overall understanding of the crashes, rather than looking at random crashes for each year. It is important to ensure that any and all locations where severe crashes have occurred are considered for safety improvements to reduce fatal and severe crashes in the near future.

2. Heat Maps

Reviewing *Heat Maps* is another way to screen locations based on driver behavior and crash patterns. These maps cover a range of engineering and non-engineering focus areas, such as impaired drivers, older drivers, unrestrained drivers and/or occupants, younger drivers, intersection related crashes, non-intersection related crashes, and roadway departure crashes. Using the crash count intervals per section square in the legend of each map, different colors show how an area “behaves.” Areas with a high frequency of red and orange squares are experiencing high levels of a certain safety issue. The various heat maps can be overlaid on each other to see if there are overlapping issues, i.e. intersection related crashes and younger drivers. This can aid in better identifying the safety issues in a particular area.

Heat Maps can be very beneficial as a behavioral screening tool for law enforcement by pinpointing areas that show overrepresentation of severe crashes involving impaired or unrestrained drivers. Law enforcement can patrol these areas or perform roadside safety checks to prevent those drivers from causing severe injuries.

3. Emphasis Area Tables

Emphasis Area (EA) Tables were developed to support implementation of the IL SHSP and compare a county's fatal and serious injury numbers to the entire state's fatal and serious injury numbers as they relate to the IL SHSP emphasis areas. Roadway systems are broken down into State and County/Local. This is similar to *Data Trees*, but unlike *Data Trees*, the *EA Tables* also show overrepresented categories and behavioral categories. Overrepresented categories are highlighted by orange cells.

The *EA Tables* also have bar charts to show the 5-year rolling averages for each emphasis area, rural versus urban disaggregation, and state versus local disaggregation. These *EA Tables* should be used with the *Data Trees* and *Heat Maps* to focus efforts on the IL SHSP emphasis areas and roadway types with greatest opportunity to decrease severe crashes.

4. Top 50 Curves with Safety Improvement Potential

Considering the need to focus on critical curves in terms of preventive countermeasures to reduce the frequency of serious injury crashes related to roadway departure, this tool focuses specifically crashes that occur on curves.

This tool can be used to help safety professionals prioritize the curves, and to determine which have the greatest safety improvement potential. A list of curves for each district is identified in this tool, for which there are many low-cost safety improvements to consider for implementation. These curves can be used as a basis for expanding the locations for consideration of improvement if similar features such as curve radius and length can be identified. Implementation of countermeasures such as chevrons, advance signing, lighting, shoulders and rumble strips, and high friction surface treatment (HFST) should be considered to help negotiate curves and to reduce the frequency and severity of crashes on curves in Illinois.

Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

Safety Engineering Technical Guidance Memorandum BSE-JR1

Data Tree Instructions

March 28, 2016

The crash *Data Trees* have been developed for all 102 counties in Illinois and all 9 districts. They were developed to provide counties and districts with insight into where crashes are occurring within their system. The *Data Trees* are meant to help identify jurisdiction, location and other various facts about the crashes in order to support and guide state and local safety planning efforts. The *Data Trees* are part of a prioritization process intended to identify facilities and crash types that appear to represent the greatest opportunity to reduce fatal and severe crashes.

Overview

The *Data Trees* aggregate five years of crashes (2010-2014) from within a county or district. This helps to identify trends and other factors that may not be apparent when looking at spot locations. The *Data Trees* also show the number of all severity crash types, as well as severe crash types. A severe crash is defined as being a fatal crash (K severity) or serious injury crash (A severity).

This memo provides step-by-step instructions on how to follow the *Data Trees*. While there are six pages for each *Data Tree*, it can become overwhelming with multiple boxes and crash statistics. This memo will walk the user through an arbitrary example county, particularly aiding in the identification of overrepresented crashes within their county.

Legend

The *Data Trees* contain a large amount of information, therefore, different color text and highlighted cells are used to help the reader identify vital pieces of information. The following provides a quick reference (or legend) for picking out these pieces of information:

- Black Numbers/Percentages: All crashes that occurred (K = fatal, A-injury = incapacitating injury, B = capacitating injury, C = apparent or possible injury, PDO/O = property damage only)
- Red Numbers/Percentages: Severe Crashes (K= fatal, A-injury= incapacitating injury)
- Yellow Highlighted Text: text highlighted in yellow indicate the areas where crashes are overrepresented. The yellow highlights are intended to help easily guide the user towards identifying high crash percentages, so as not to overlook anything due to the large amount of information shown in the *Data Trees*.

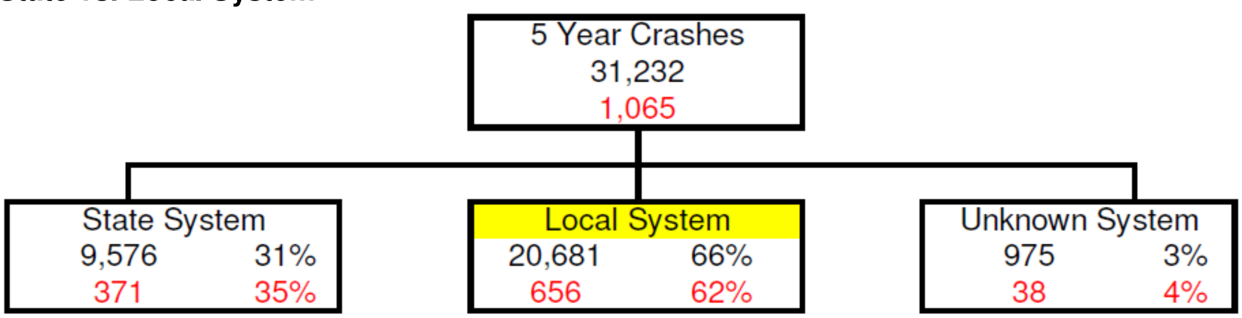
Interpreting the *Data Tree* - Start at the Top and Work Your Way Down

An arbitrary county will be used as an example for these step-by-step instructions. The most effective way to walk through the *Data Trees* is to start at the top of the *Data Tree* at the higher level crash numbers, and to work down the branches to identify any trends.

Step 1- State vs. Local System

As shown in Figure 1, it is easiest to start at the very top box of the *Data Tree*. The first box indicates that there were 31,232 KABCO crashes from 2010 to 2014 and 1,065 severe crashes in the same time period (shown in red). The next step is to move down to the next branch, or set of boxes, which breaks the crashes down by system. State and Local Systems are shown on this branch, along with crashes coded with an "Unknown System". The highlighted box shows that the majority of the KABCO crashes and severe crashes occurred on the Local System (66 percent and 62% respectively), which will be the area of focus moving forward.

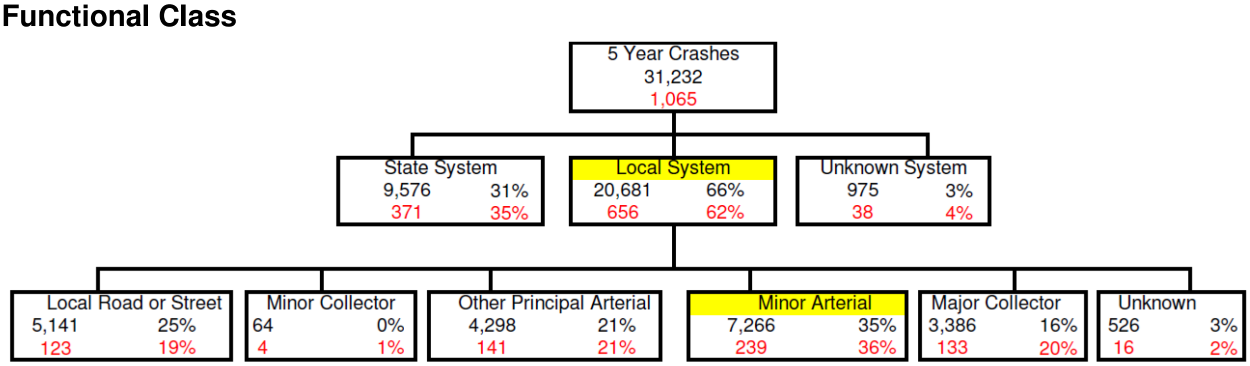
FIGURE 1
State vs. Local System



Step 2- Functional Class

Since the majority of the crashes occurred on the Local System, the functional class which most of the severe crashes occurred can be determined. Note, since pages 1, 2 and 3 focus on the State System crashes, whereas, page 4 focuses on the Local System crashes, pages 2 and 3 are able to be skipped. On page 4 the box with Minor Arterial is highlighted in yellow, because over 35 percent of the Local System KABCO crashes and 36% of the severe crashes occurred on the Minor Arterial system. While there might still be interest in Local Road or Street (25 percent KABCO) or Other Principal Arterial (21 percent KABCO) due to their somewhat high severe crash percentages, the focus will remain on the Minor Arterial system since this functional class is responsible for the highest percentage of severe crashes. Refer to Figure 2.

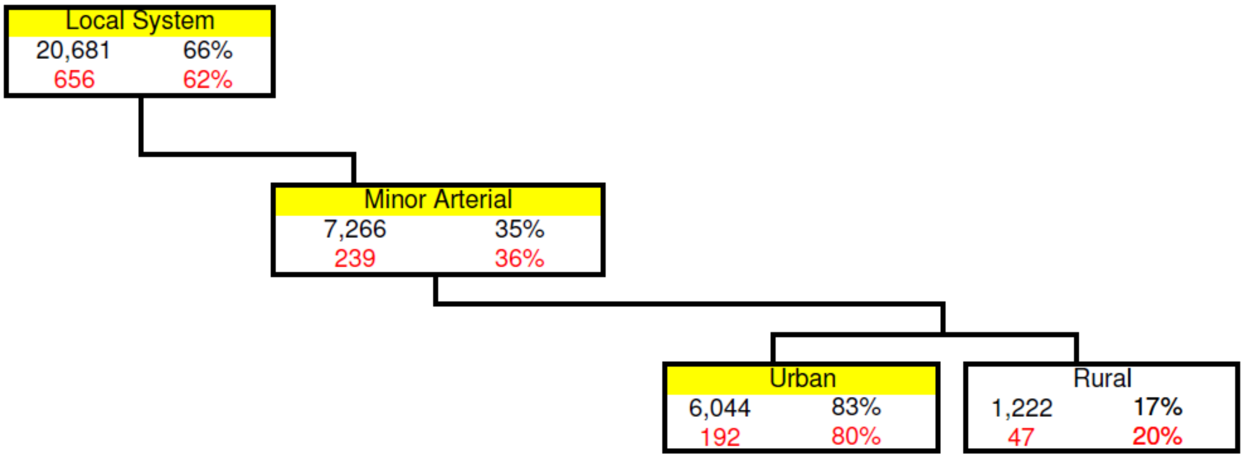
FIGURE 2
Functional Class



Step 3- Urban versus Rural

Now that crashes on Local, Minor Arterial system have been targeted, more specific information regarding these crashes can be identified. Skipping to the 6th page of the *Data Tree* (not included in this document) provides additional information on the Local, Minor Arterial system. As shown on page 6, the Minor Arterial crashes are broken into two categories, Urban and Rural. As shown in Figure 3, the majority of the Local, Minor Arterial crashes occurred on Urban roadways (83 percent KABCO and 80 percent of the severe). Refer to Figure 3.

FIGURE 3
Urban vs. Rural

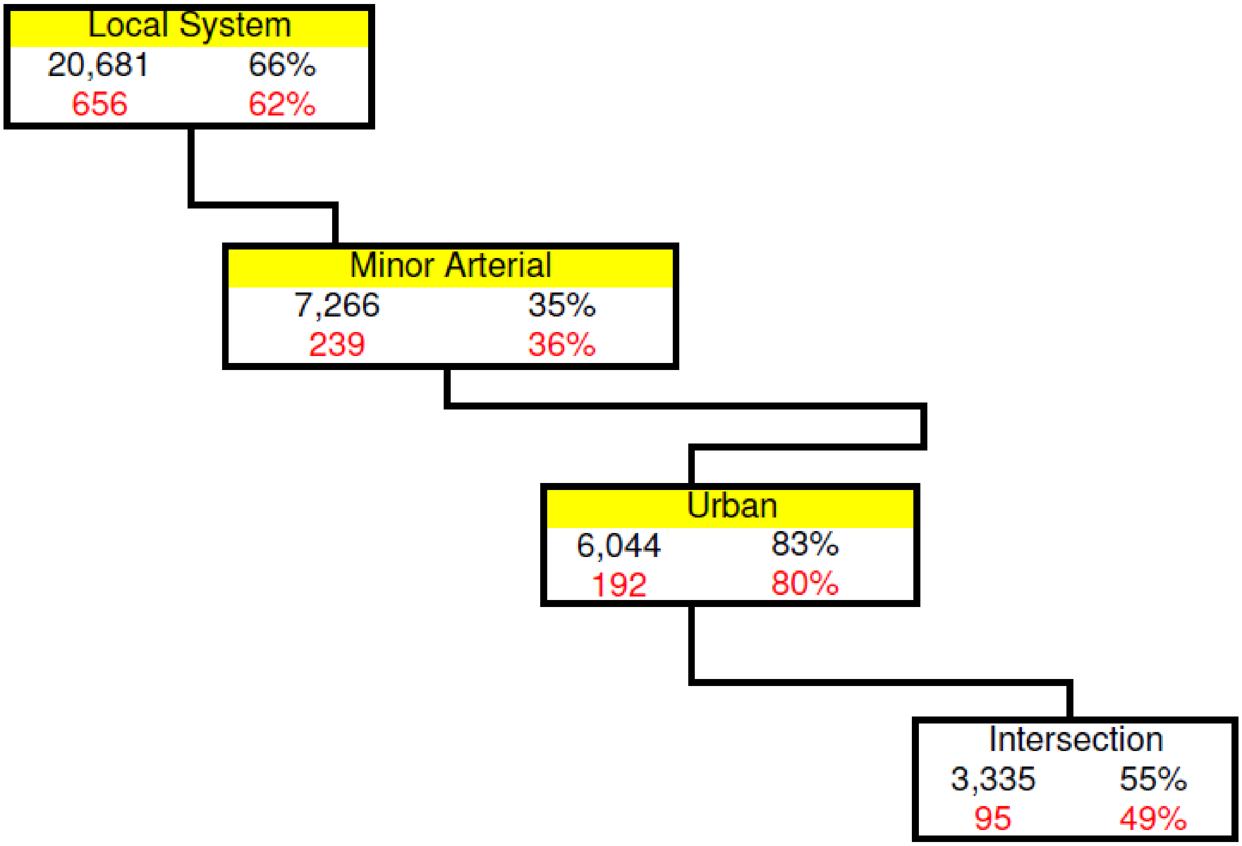


Step 4- Intersection vs. Non-Intersection

Now that the Local, Minor Arterial, Urban system crashes have been targeted, intersection versus non-intersection crashes can be identified. For this example, the severe crashes are nearly equally split between intersection (49 percent) and non-intersection; however, there are slightly more KABCO crashes occurring at intersections (55 percent KABCO). For the purpose of these instructions, the focus of the next step will be on the intersection crashes.

Note- since the focus is on severe crashes, the non-intersection crashes should also be considered as it represents 51 percent of severe crashes. Refer to Figure 4.

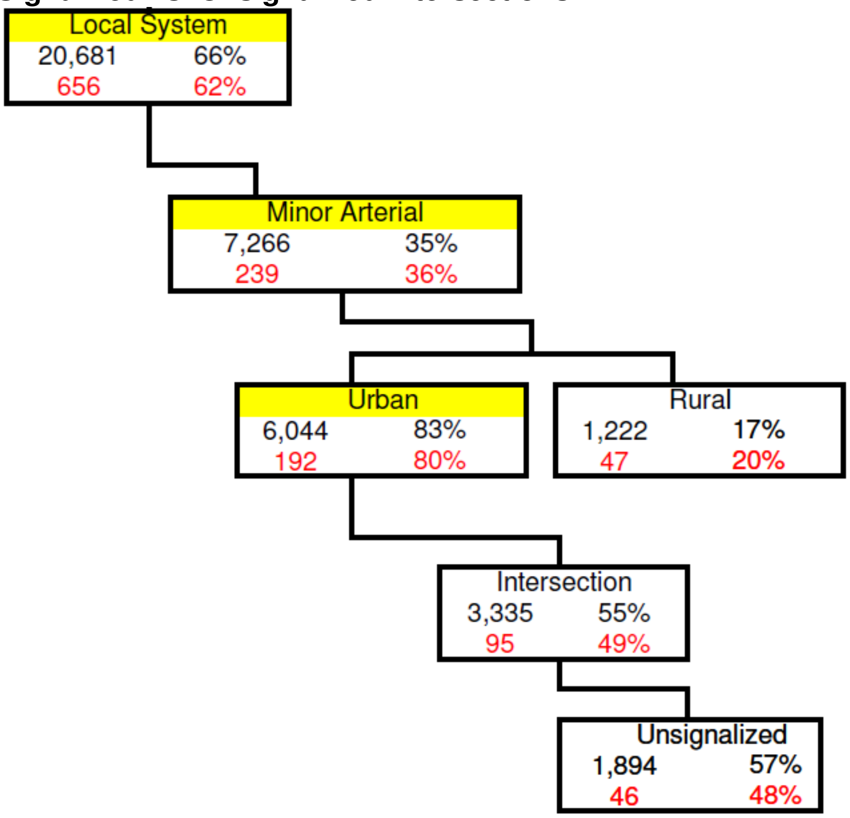
FIGURE 4
Intersection vs. Non-Intersection



Step 5- Signalized vs. Unsignalized

Now that intersections on Local, Minor Arterial, Urban system have been identified, signalized or unsignalized intersections intersection can be investigated. Looking at the *Data Tree*, the majority of the crashes occurred at unsignalized intersections (57 percent KABCO). While this is where the majority of the crashes occurred, signalized intersections should not be dismissed as the focus continually is on severe crashes, and they reflect 52% of the severe crashes for the Local, Minor Arterial, Urban system-intersections. After all, over 1,388 KABCO crashes (42 percent) occurred at signalized intersections. For the purpose of these instructions, moving forward with unsignalized intersections will be looked at in further detail. Refer to Figure 5.

FIGURE 5
Signalized vs. Unsignalized Intersections

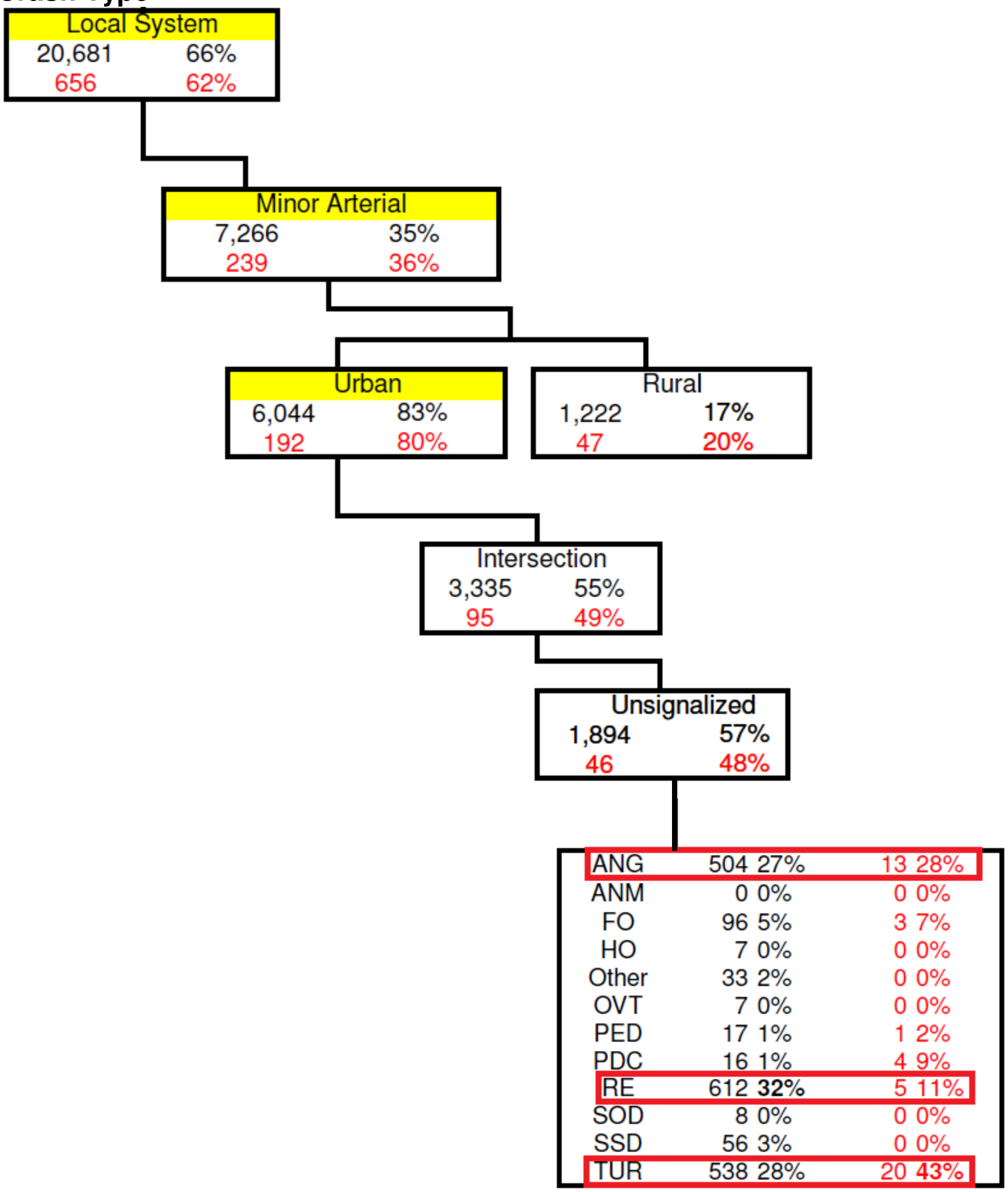


Step 6- Crash Type

Finally, a look at the type of crashes that occurred on the Local, Minor Arterial, Urban, Unsignalized Intersections can be investigated. The boxes at the very bottom of the Local, Minor Arterial, Urban, Unsignalized Intersection branch indicates the frequency of crashes by crash type. The crash types are abbreviated to fit in the boxes. There is a list of abbreviations for the different crash types in the lower left-hand corner of each page of the *Data Tree*. Figure 6 shows the crash types for the unsignalized intersections. As shown in the figure, 32 percent of KABCO crashes were Rear End, followed by 28 percent Turning, and 27 percent were Angle crashes. These align with the severe crashes (11 percent, 43 percent, and 28 percent respectively) except that Turning had the most severe crashes and were over-represented when compared to the total crashes.

FIGURE 6

Crash Type



Summary

In summary, the *Data Tree* is a tool that can be used to assist in the decision making process of identifying severe crash trends and issues. The example shown in these instructions simply follows one path, identifying the highest frequency of severe crashes from the top branch of the *Data Tree* and following it directly to the bottom branch (refer to Figure 7). It should be stressed and highly encouraged that all options/paths of the *Data Trees* be explored in order to consider severe crash trends on both the State and Local Systems.

Additionally, while the KABCO crashes (shown in black) were the main focus of these instructions, great consideration shall be given to the severe crashes (shown in red). In many instances in this example, the percentage of severe crashes were similar to that of the KABCO crashes; however, this is not always the case (as shown in Figure 6). For reasons like this, it is essential to investigate both KABCO and severe crashes and use best judgement to decide which systems warrant attention with the goal of reducing fatalities and serious injuries.

Figure 7
Path Summary

Source: IDOT Crash Extracts 2010 - 2014 Crash Data
'All crashes' include fatal, all injury and property damage only crashes
'Severe crashes' include fatal and incapacitating injury crashes only (K + A)

Arbitrary County, Illinois
2010 to 2014 Crash Data Overview
Local System - Minor Arterial Roadways

Example	
All Crashes	%
Severe Crashes	%

5 Year Crashes
31,232
1,065

	State System	Local System	Unknown System
All Crashes	9,576 31%	20,681 66%	975 3%
Severe Crashes	371 35%	656 62%	38 4%

Local System:

	Local Road or Street	Minor Collector	Other Principal Arterial	Minor Arterial	Major Collector	Unknown
All Crashes	5,141 25%	64 0%	4,298 21%	7,266 35%	3,386 16%	526 3%
Severe Crashes	123 19%	4 1%	141 21%	239 36%	133 20%	16 2%

Minor Arterial:

	Urban	Rural
All Crashes	6,044 83%	1,222 17%
Severe Crashes	192 80%	47 20%

Urban:

	Non-Intersection	Intersection
All Crashes	2,709 45%	3,335 55%
Severe Crashes	97 51%	95 49%

Urban Non-Intersection:

	Roadway Departure	On Curve
All Crashes	574 21%	117 20%
Severe Crashes	46 47%	15 33%

ANG	147	5%	5	5%
ANM	36	1%	0	0%
FO	430	16%	28	29%
HO	52	2%	5	5%
Other	364	13%	9	9%
OVT	40	1%	11	11%
PED	50	2%	13	13%
PDC	19	1%	3	3%
RE	942	**35%**	10	10%
SOD	52	2%	2	2%
SSD	311	11%	2	2%
TUR	266	10%	9	9%

Urban Intersection:

	Signalized	Unsignalized	Other/Unknown
All Crashes	1,388 42%	1,894 57%	53 2%
Severe Crashes	44 46%	46 48%	5 5%

Signalized:

ANG	350	25%	16	**36%**
ANM	0	0%	0	0%
FO	40	3%	1	2%
HO	4	0%	0	0%
Other	8	1%	0	0%
OVT	2	0%	0	0%
PED	10	1%	1	2%
PDC	11	1%	2	5%
RE	355	26%	11	25%
SOD	5	0%	0	0%
SSD	32	2%	0	0%
TUR	571	**41%**	13	30%

Unsignalized:

ANG	504	27%	13	28%
ANM	0	0%	0	0%
FO	96	5%	3	7%
HO	7	0%	0	0%
Other	33	2%	0	0%
OVT	7	0%	0	0%
PED	17	1%	1	2%
PDC	16	1%	4	9%
RE	612	**32%**	5	11%
SOD	8	0%	0	0%
SSD	56	3%	0	0%
TUR	538	28%	20	**43%**

Rural:

	Animal	Non-Animal
All Crashes	99 8%	1,123 92%
Severe Crashes	1 2%	46 98%

Non-Animal:

	Non-Intersection	Intersection
All Crashes	533 47%	590 53%
Severe Crashes	25 54%	21 46%

Rural Non-Intersection:

	Roadway Departure	On Curve
All Crashes	202 38%	55 27%
Severe Crashes	17 68%	3 18%

ANG	19	4%	1	4%
FO	143	27%	12	**48%**
HO	17	3%	3	12%
Other	60	11%	2	8%
OVT	23	4%	2	8%
PED	2	0%	1	4%
PDC	5	1%	1	4%
RE	177	**33%**	0	0%
SOD	19	4%	0	0%
SSD	24	5%	2	8%
TUR	44	8%	1	4%

Rural Intersection:

	Signalized	Unsignalized	Other/Unknown
All Crashes	140 24%	449 76%	1 0%
Severe Crashes	4 19%	17 81%	0 0%

Signalized:

ANG	27	19%	1	25%
FO	1	1%	0	0%
HO	1	1%	0	0%
Other	0	0%	0	0%
OVT	0	0%	0	0%
PED	1	1%	1	25%
PDC	1	1%	0	0%
RE	49	35%	0	0%
SOD	0	0%	0	0%
SSD	2	1%	0	0%
TUR	58	**41%**	2	**50%**

Unsignalized:

ANG	83	18%	7	**41%**
FO	32	7%	1	6%
HO	2	0%	0	0%
Other	14	3%	0	0%
OVT	10	2%	2	12%
PED	2	0%	0	0%
PDC	4	1%	0	0%
RE	159	**35%**	3	18%
SOD	3	1%	0	0%
SSD	9	2%	0	0%
TUR	131	29%	4	24%

Collision Type Abbreviations-
ANG: Angle
ANM: Animal
FO: Fixed Object
HO: Head-On
Other: Other Non-Collision/Other Object/Parked Car/Train/Unknown
OVT: Overturned
PED: Pedestrian
PDC: Pedalcyclist
RE: Rear End
SOD: Sideswipe Opposite Direction
SSD: Sideswipe Same Direction
T: Turning

Query definitions for 'Roadway Departure' and 'On Curve':
Roadway Departure: FO/OVT/HO/SOD
On Curve: Road Departure Crashes on Level Curve/Curve on Grade/Curve on Hillcrest

Urban and Rural designations are defined by the Class of Trafficway code in the Illinois Roadway Inventory System.

Intersection crashes are defined as crashes coded as intersection related by the reporting police officer. Traffic control devices are considered 'Signalized' if the code is equal to '3 - Traffic Signal'. 'Non-Signalized' codes is equal to '1 - No Controls', '2 - Stop Sign/Flasher' or '4 - Yield'. 'Other/Unknown' traffic control codes are the remaining inputs.

State System/Local System/Unknown System is defined by the Class of Trafficway code in the Illinois Roadway Inventory System. Crashes are considered 'Local' if the Class of Trafficway code is equal to '3 - County and Local Roads Rural' or '8 - City Streets Urban'. 'Unknown Systems' are equal to '0 - Unknown Urban/Rural'. All other entries are 'State System'.

Results of the analyses are based on data that was received from the Illinois Department of Transportation.
The data was used "as is" for analysis purposes and should be interpreted accordingly.

Illinois Department of Transportation
CH2MHILL
Draft - February 2016

Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

Safety Engineering Technical Guidance Memorandum BSE-MT1

Emphasis Area Tables and Graphs

March 28, 2016

As with many of the other safety tools developed, IL SHSP *Emphasis Area (EA) Tables* have been developed for all 102 counties in Illinois and all 9 districts. They were developed to provide counties and districts with insight into where severe crashes are occurring within their system. *EA Tables* are meant to help identify where high frequency severe crashes occur, it is part of a prioritization process intended to represent the greatest opportunity to reduce fatal and serious injury crashes.

Overview

EA Tables aggregate five years of crashes (2009-2013) from within a county or district. This helps to identify trends and other factors that may not be apparent when looking at spot locations. *EA Tables* show the number of all fatalities and A-injuries.

This portion of the memo provides step-by-step instructions on how to follow the *EA Tables* and its charts. It can become overwhelming with the multiple charts and graphs, but it is simply breaking each emphasis area down by the aggregate five years of data. This memo will walk the user through an example county, as included in this memo, aiding in the identification of overrepresented fatalities and A-injuries within that county.

Legend

EA Tables contain a large amount of information, therefore, different color text and highlighted cells are used to help the reader identify vital pieces of information. The following provides a quick reference (or legend) for picking out these pieces of information:

- Roadway Table Title Highlighted Blue/Purple/Pink/Green: Represent State Roadways, Local/County Roadways, All (State+Local/County) Roadways, and Total Illinois Roadway fatalities and A-injuries.
- Black Numbers/Percentages: All K and A-injury crashes that occurred (K = fatal, A-injury = incapacitating injury).
- Red Underlined Percentages: Represent the largest category percentage.
- Orange Highlighted Cell: Cells highlighted in orange indicate overrepresentation of an Emphasis Area when compared to ‘Illinois – All Roadways’ percentage.

Interpreting the *Emphasis Area Table's* Charts - Start from Left to Right, and Top to Bottom.

The Impaired Driver Emphasis Area will be used as an example for these step-by-step instructions. The most effective way to walk through the *EA Tables* is to start at the left of the table to determine which emphasis area is being analyzed. Then move right along that same row and read the top of the chart to identify roadway jurisdiction and crash severity of interest.

The leftmost column indicates the different emphasis areas. Find the Impaired Driver row and move right to the second column where it shows that 51.2% of all fatalities that occurred on state roadways, and continue to move to the right where it shows 62.9% of fatalities occurred on Local/County roadways. 51.2% on the state roadways is red and the cell is highlighted orange because it is greater than the 45.2% fatalities that occurred on the statewide Illinois roadway. This means that the Impaired Driver Emphasis Area for the example county's state roadways are overrepresented.

Interpreting *Emphasis Area Table's* Bar Charts

Bar charts are created for each Emphasis Area comparing State and Local roadways by fatalities and A-injuries for five years of crash data (2009-2013). Rolling averages are taken for the five years and plotted at the top of each bar chart. Bar charts can be read by determining the year at the bottom and reading the number of combined fatalities and A-injuries that occurred that year at the left of the chart. The bars are broken down by State and Local roadways.

Summary

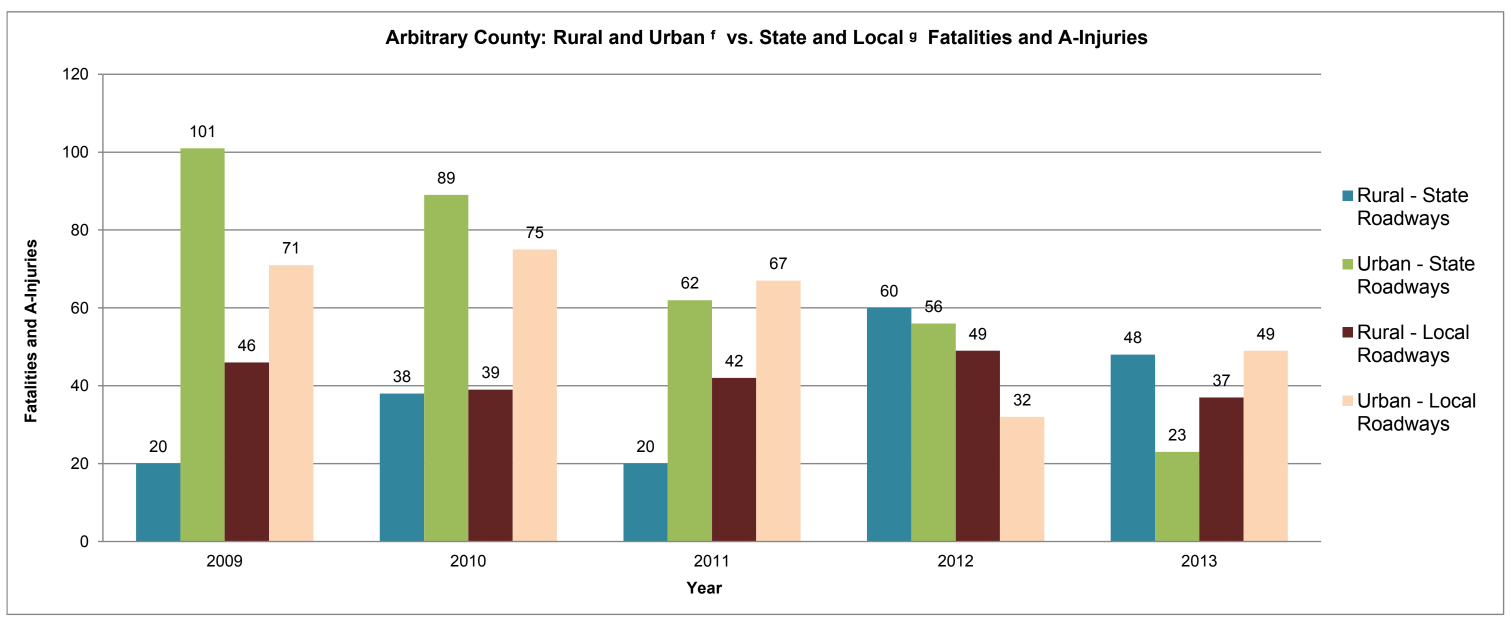
In summary, IL SHSP *EA Tables* can be used to assist in the decision making process by identifying highest percentage fatal and A-injury crash trends and issues on both the State and Local systems. Great consideration to the severe crashes shown in red should be considered. It is essential to investigate both red and non-red percentage severe crashes and use best judgement to decide which systems warrant attention.

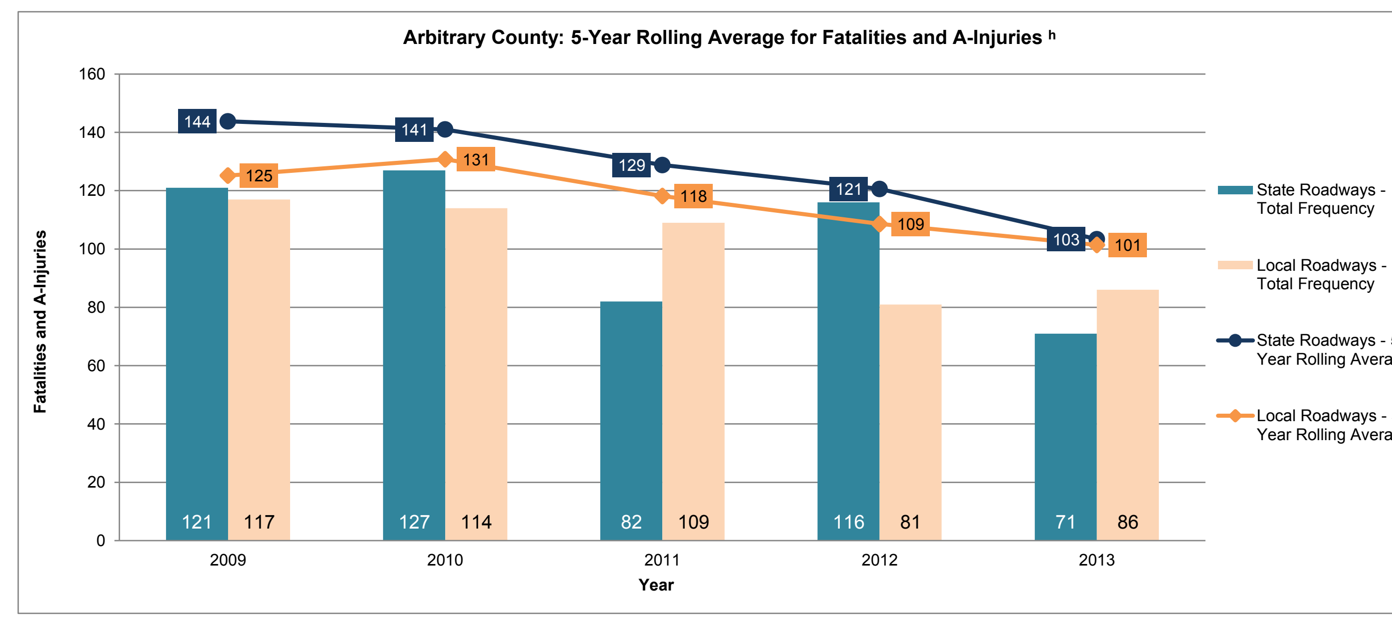
Arbitrary County: SHSP Emphasis Areas Table and Bar Charts

(Fatalities and A-Injuries from 2009 to 2013 crashes*)

	State Roadways						Local/County Roadways						All Roadways						All Roadways[a]					
	Fatalities			A-Injuries			Fatalities			A-Injuries			Fatalities			A-Injuries			Fatalities			A-Injuries		
	Percent	Frequency	Percent Change '09 to '13[b]	Percent	Frequency	Percent Change '09 to '13[b]	Percent	Frequency	Percent Change '09 to '13[b]	Percent	Frequency	Percent Change '09 to '13[b]	Percent	Frequency	Percent Change '09 to '13[b]	Percent	Frequency	Percent Change '09 to '13[b]	Percent	Frequency	Percent Change '09 to '13[b]	Percent	Frequency	Percent Change '09 to '13[b]
Emphasis Areas		41	66.7%		476	-47.0%		35	0.0%		472	-28.7%		76	26.7%		948	-38.1%		4,703	8.8%		62,274	-5.4%
Younger Driver (16-20)	19.5%	8	100.0%	19.5%	93	-77.4%	8.6%	3	-100.0%	27.5%	130	-16.7%	14.5%	11	0.0%	23.5%	223	-44.8%	14.7%	692	11.3%	20.7%	12,889	-13.2%
Older Driver (65+)	19.5%	8	0.0%	17.6%	84	-47.8%	22.9%	8	-50.0%	13.1%	62	-7.1%	21.1%	16	50.0%	15.4%	146	-32.4%	17.4%	819	17.8%	15.3%	9,554	4.4%
Speeding/Aggressive Driver[c]	17.1%	7	0.0%	24.8%	118	-63.3%	28.6%	10	0.0%	19.9%	94	-28.6%	22.4%	17	133.3%	22.4%	212	-49.0%	23.3%	1,096	10.7%	21.0%	13,072	-1.0%
Unrestrained Occupants	34.1%	14	66.7%	17.0%	81	-25.0%	62.9%	22	16.7%	24.4%	115	-9.1%	47.4%	36	33.3%	20.7%	196	-14.7%	48.6%	2,288	10.9%	19.1%	11,906	-14.2%
Impaired Driver	51.2%	21	50.0%	18.3%	87	20.0%	62.9%	22	60.0%	18.6%	88	-47.4%	56.6%	43	57.1%	18.5%	175	-24.1%	45.2%	2,125	10.4%	14.2%	8,871	-20.7%
Fatigued/Drowsy/Distracted Driver	4.9%	2	0.0%	4.6%	22	20.0%	2.9%	1	-100.0%	5.7%	27	100.0%	3.9%	3	100.0%	5.2%	49	50.0%	2.6%	123	25.0%	5.1%	3,170	15.9%
Pedestrian	19.5%	8	-66.7%	3.8%	18	-66.7%	5.7%	2	-100.0%	10.4%	49	-60.0%	13.2%	10	-75.0%	7.1%	67	-61.1%	13.5%	633	11.4%	7.8%	4,882	-14.6%
Pedalcyclist	2.4%	1	-100.0%	0.2%	1	-100.0%	0.0%	0	0.0%	1.7%	8	-50.0%	1.3%	1	-100.0%	0.9%	9	-66.7%	2.8%	130	50.0%	3.4%	2,092	-0.7%
Motorcycle	17.1%	7	0.0%	12.2%	58	-50.0%	20.0%	7	0.0%	12.1%	57	-53.8%	18.4%	14	0.0%	12.1%	115	-51.7%	15.2%	715	17.4%	9.1%	5,637	-15.6%
Heavy Vehicle	14.6%	6	0.0%	6.7%	32	0.0%	2.9%	1	0.0%	1.7%	8	-50.0%	9.2%	7	0.0%	4.2%	40	-12.5%	13.7%	644	51.5%	7.0%	4,357	3.1%
Train	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.2%	1	-100.0%	0.0%	0	0.0%	0.1%	1	-100.0%	0.9%	44	-72.7%	0.1%	48	22.2%
Road Departure[d]	46.3%	19	100.0%	32.4%	154	-16.7%	68.6%	24	-28.6%	41.1%	194	-15.8%	56.6%	43	0.0%	36.7%	348	-16.1%	52.5%	2,471	12.9%	32.1%	19,972	-12.1%
Intersection[e]	24.4%	10	0.0%	45.2%	215	-54.1%	37.1%	13	0.0%	32.2%	152	-15.2%	30.3%	23	133.3%	38.7%	367	-40.4%	25.2%	1,186	5.2%	43.7%	27,188	-5.0%
Work Zone	2.4%	1	-100.0%	2.7%	13	-100.0%	0.0%	0	0.0%	0.0%	0	0.0%	1.3%	1	-100.0%	1.4%	13	-100.0%	2.8%	134	-9.7%	1.7%	1,086	-52.4%

* Numbers in this table represent the count of Fatalities and A-Injuries that occurred in Illinois crashes from 2009 to 2013 for the county shown above.





Areas for potential Safety Program focus:

- Orange fill indicates overrepresentation of an Emphasis Area when compared to 'Illinois - All Roadways' percentage
- 0.0% - Underlined red text indicates largest category percentage

a Illinois - All Roadways data includes crash data from all 102 counties in Illinois.

b Percent change = [(2013 Value - 2009 Value) / (2009 Value)] x 100

c Includes exceeding authorized speed limit, exceeding safe speeds for conditions, failing to reduce speed to avoid crash, or operating vehicle in an erratic, reckless, careless, negligent, or aggressive manner.

d Includes overturned, fixed object, sideswipe opposite direction, and head on collision types.

e Defined as collisions which the reporting officer has coded as intersection related.

f Rural and Urban roadways are defined using the Class of Trafficway. Rural roadways include the following Class of Trafficway designations: "Unmarked Highway - Rural," "Controlled - Rural," "State Numbered - Rural," "County & Local Roads - Rural," and "Toll Roads - Rural". Urban roadways include the following Class of Trafficway designations: "Controlled - Urban," "State Numbered - Urban," "Unmarked Highway - Urban," "City Streets - Urban", and "Toll Roads - Urban".

g State and Local/County roadways are defined using the Class of Trafficway. Local/County roadways include the following Class of Trafficway designations: "County & Local Roads - Rural" and "City Streets - Rural". State roadways include the following Class of Trafficway designations: "Unmarked Highway - Rural," "Controlled - Rural," "State Numbered - Rural," "Toll Roads - Rural," "Controlled - Urban," "State Numbered - Urban," "Unmarked Highway - Urban," and "Toll Roads - Urban".

h Example 5-Year Rolling Average Calculation for 2009 Fatalities: (2005 Fatalities + 2006 Fatalities + 2007 Fatalities + 2008 Fatalities + 2009 Fatalities) / 5 Years

Notes:

1 Emphasis Area categories are not mutually exclusive, meaning a single crash may be included in multiple Emphasis Area statistics. Hence, the sum of all Emphasis Area categories for each system may be greater than the total frequency for that system.

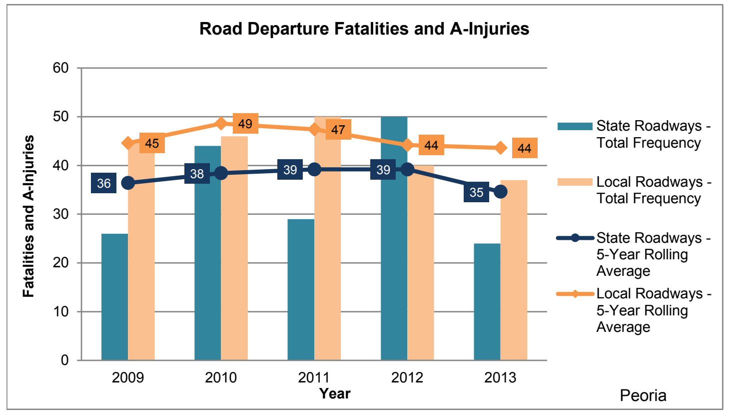
Disclaimer:

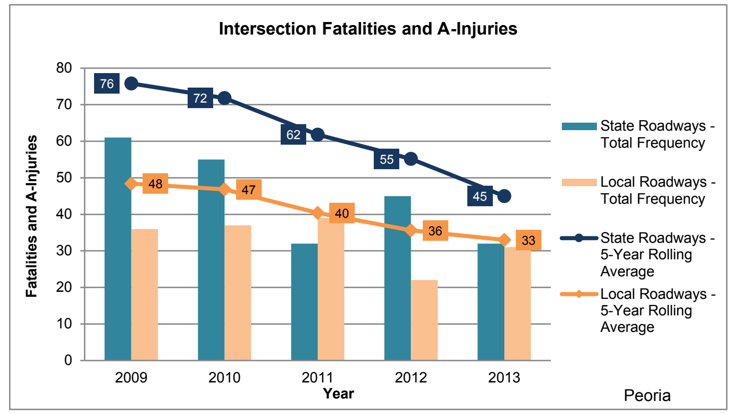
Results of the analyses are based on data that was received from the Illinois Department of Transportation. Crash data represents years 2005 to 2013 and was obtained from the state police and other enforcement agencies. Crash data for years 2005 and 2006 was received from IDOT on March 24, 2009, crash data for years 2007 to 2012 was received from IDOT on November 26, 2013, and crash data for 2013 was received from IDOT on December 4, 2014. The data was used "as is" for analysis purposes and should be interpreted accordingly.

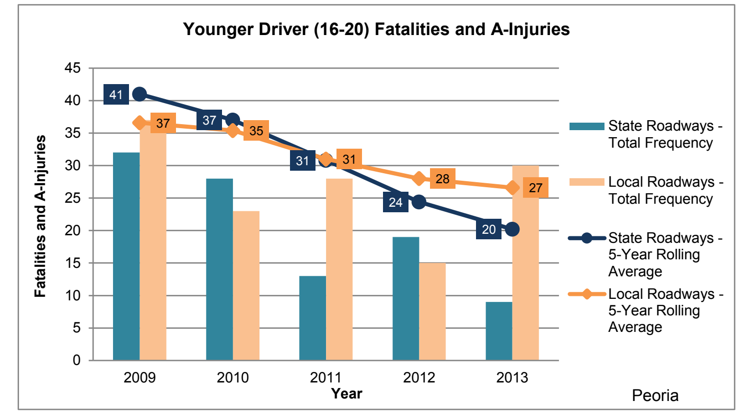
Arbitrary County: SHSP Emphasis Areas Table and Bar Charts

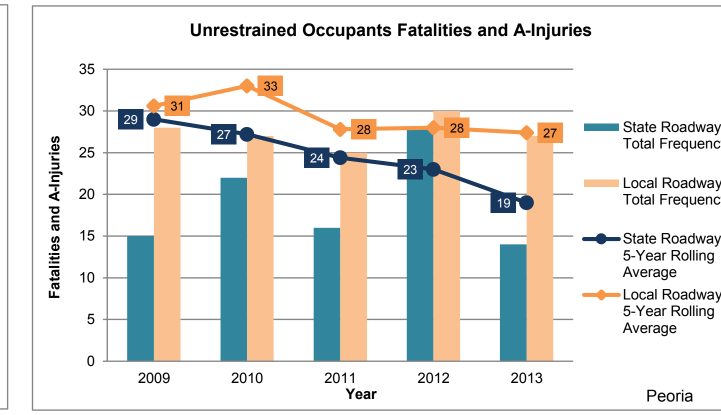
5-Year Rolling Averages for Fatalities and A-Injuries in Descending Order
(Based on 2005 to 2013 crashes*)

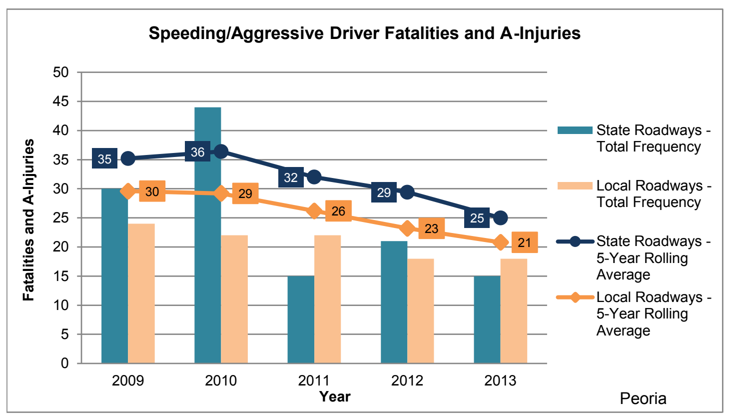
All Roadways

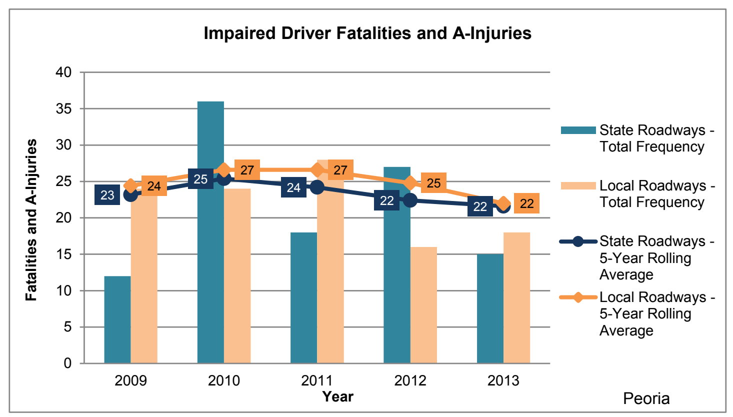


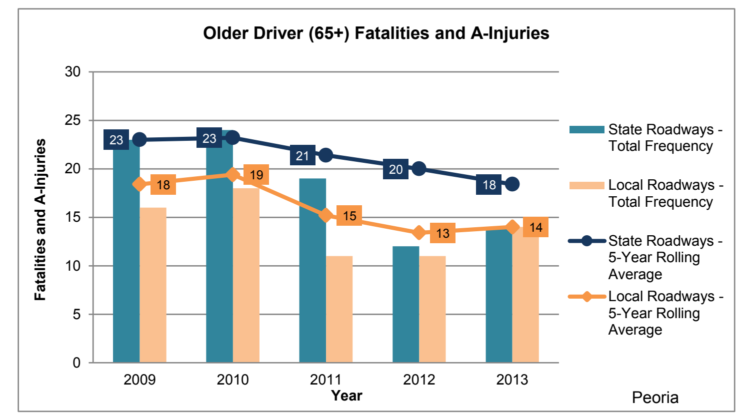


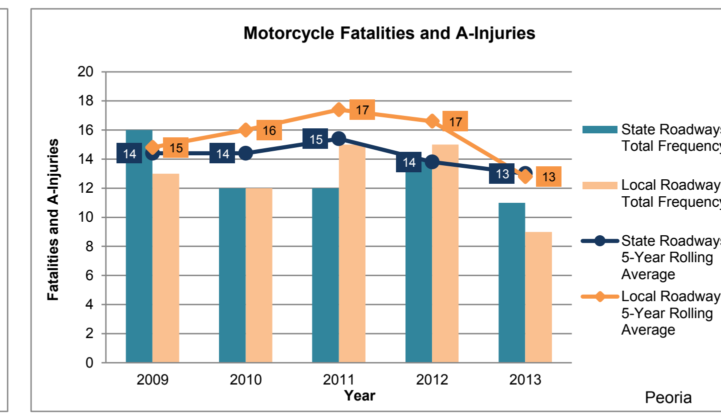


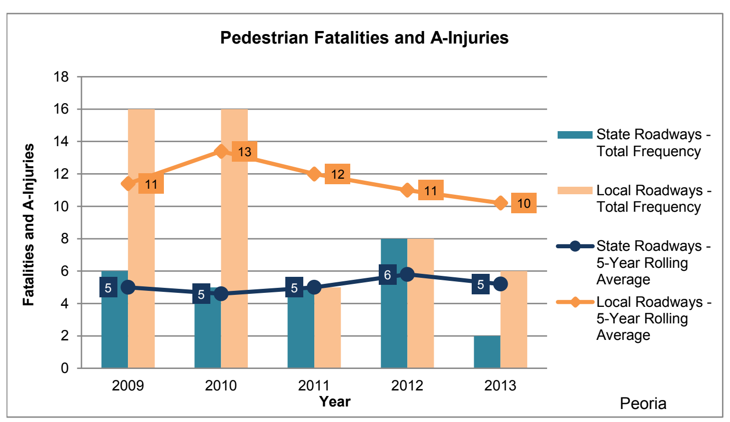


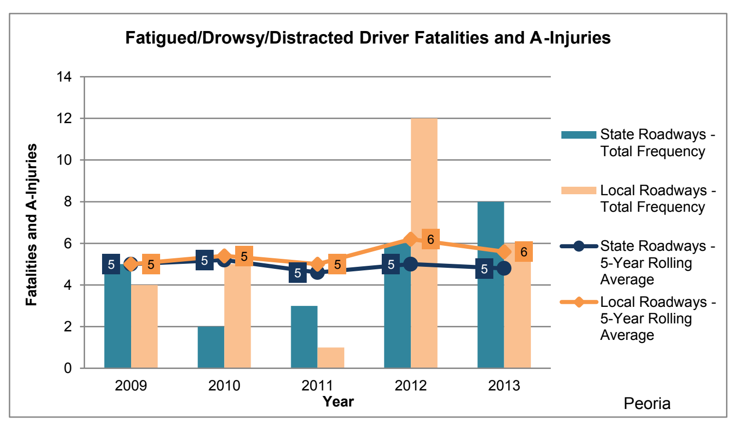


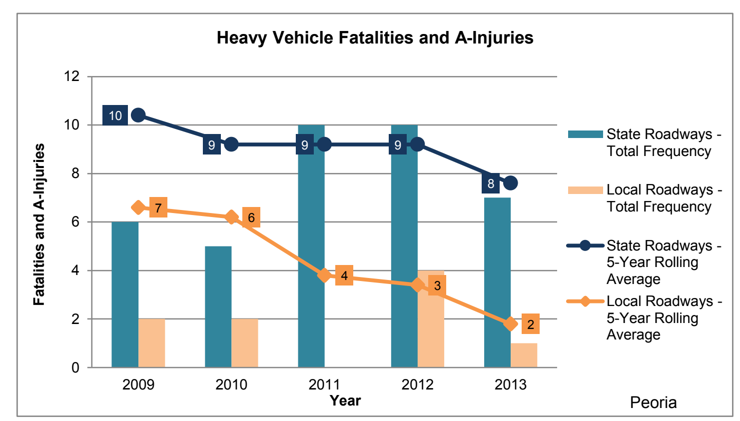


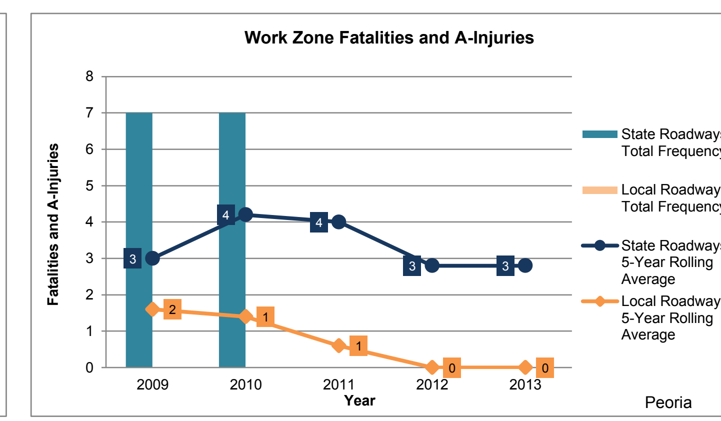


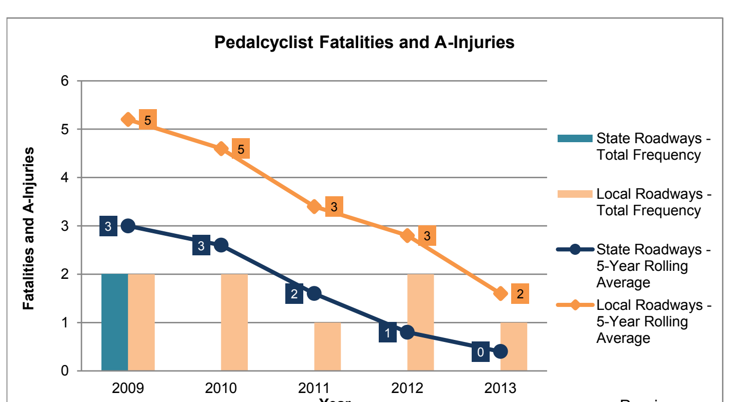


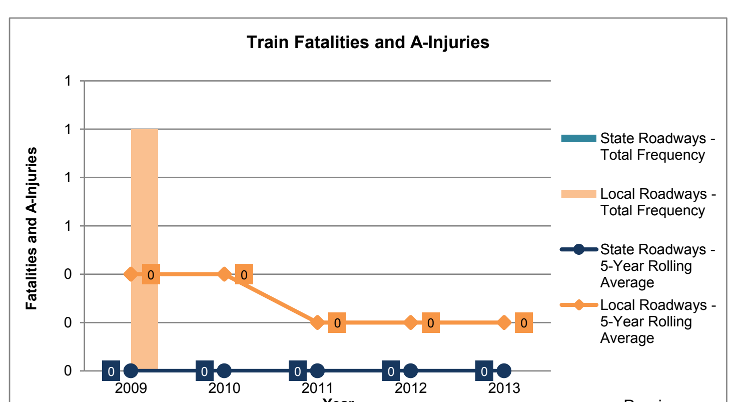












* Numbers in these graphs represent the count of Fatalities and A-Injuries that occurred in Illinois crashes from 2005 to 2013 for the county shown above.

Notes:

1 All graphs are sorted in descending order (left to right, top to bottom) according to each Emphasis Area's cumulative Fatality and A-Injury frequency from 2009 to 2013 on all roadway systems within the county, with the Emphasis Area which is associated with the highest Fatality and A-Injury frequency within the county as the first graph (top, left), and the Emphasis Area which is associated with the lowest Fatality and A-Injury frequency within the county as the last graph (bottom, right).

2 Emphasis Area categories are not mutually exclusive, meaning a single crash may be included in multiple Emphasis Area statistics. Hence, the sum of Fatalities and A-injuries for all Emphasis Area categories may be greater than the total frequency for that county.

Disclaimer:

Results of the analyses are based on data that was received from the Illinois Department of Transportation. Crash data represents years 2005 to 2013 and was obtained from the state police and other enforcement agencies. Crash data for years 2005 and 2006 was received from IDOT on March 24, 2009, crash data for years 2007 to 2012 was received from IDOT on November 26, 2013, and crash data for 2013 was received from IDOT on December 4, 2014. The data was used "as is" for analysis purposes and should be interpreted accordingly.

Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

Safety Engineering Technical Guidance Memorandum BSE-CL1

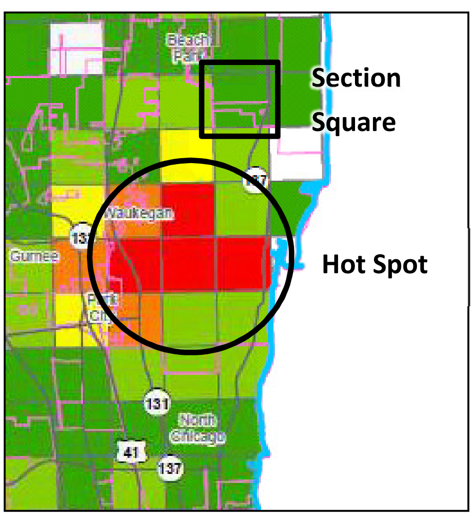
Heat Map Instructions

March 28, 2016

Background

Heat Maps are produced to identify specific locations where high severe crash occurrences continually occur. These maps summarize the frequency of severe crashes within a given geographical area. Section lines (1 square mile) were mapped with a range of colors identifying the “hot spots.” Identifications of clusters where there are many hot spots indicate locations where safety programs may be most effective. This map series analysis was performed summarizing fatal, A-injury, and B-injury crashes (KAB crashes) to minimize the effects of a small sample size. As the number of people in each vehicle is random and not stable, the crash is counted as a whole. Crash frequencies will serve as the measurement of crash distribution rather than the fatalities and serious injuries number.

Heat Maps should be used in conjunction with the *Data Trees* and/or *EA Tables*. The *Data Trees* and/or *EA Tables* can be used first to identify the specific issue within the county or district. Then *Heat Maps* can be used to find specific location(s) throughout the county where appropriate countermeasures can be implemented. Multiple *Heat Maps* can be considered to determine where multiple factors may be associated with particular severe crashes (i.e, Impaired Driving and Occupant Protection, or Intersections and Younger Drivers) This approach uses two methodology (numeric data analysis and spatial data analysis) to target an area’s top issues.

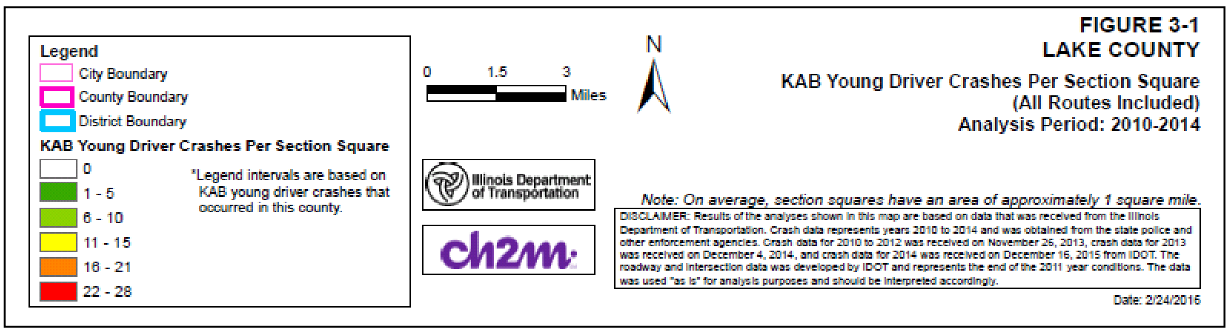


Emphasis Area

The *Heat Maps* are created for counties by summarizing the number of KAB crashes within the county boundaries. In the *Heat Maps* series for each county, 14 IL SHSP emphasis areas are presented including Young Driver, Older Driver, Speeding/Aggressive Driver, Impaired Driver, Unrestrained Occupants, Pedestrian, Pedalcyclist, Motorcycle, Heavy Vehicle, Intersection Related, Roadway Departure, Work Zone, Train, and Distracted/Fatigued/Drowsy Driver. Additional *Heat Maps* were developed for highly concentrated urban areas where more detail is necessary.

Legend

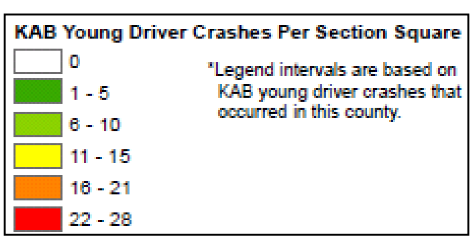
A classification of data is needed to visualize the changing number of crashes or crash frequency through the use of color. A higher number of severe crashes is visualized in red, while a lower number of crashes is visualized in green. Often, different classification types are chosen based on how well the classification describes the data. The classification type used to describe KAB crash data is ‘equal interval’.



Equal Interval

Equal interval classes divide the range of attribute values into equal-sized sub-ranges. This allows one to specify the number of intervals, and ArcGIS will automatically determine the class breaks based on the value range. Equal interval is best applied to familiar data ranges, such as percentages and temperature. This method emphasizes the amount of an attribute value relative to other values. For example, if the user specifies five classes for a field whose values range from 1 to 100, ArcGIS will create four classes with ranges of 1-20, 21-40, 41-60, 61-80, and 81-100.

In the example below, the entire range of crashes per section square is 0 to 28. No crashes are in a singular category, because this will signal that certain parts of the county do not have any issues with KAB crashes. The remaining crashes per section squares will be divided further in to increments of no less than 5. Because 28 is not divisible by 5, the remaining 3 will be distributed among the last two categories (orange and red).



Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

Safety Engineering Technical Guidance Memorandum BSE-MT1

Identification of Top 50 Curves with Safety Potential

March 28, 2016

Roadway Departure is a priority within the Illinois Strategic Highway Safety Plan. Opportunities to reduce roadway departure crashes are concentrated at curve locations. One of the most critical design elements from the standpoint of design consistency is horizontal alignment. Curve crashes identified in this analysis tool are those found in the Illinois crash reports identified crashes as occurring on three specific horizontal alignment types (that is, curve level, curve on hillcrest, and curve on grade).

Overview

The ranks of *Top 50 Curves with Safety Improvement Potential* are computed based on their weighted sum of KAB (fatality [K], incapacitating injury [A-injury], and non-incapacitating injury [B-injury]) crash frequency.

Legend

Identification of curves required a large amount of information and calculations. The following provides a quick reference (or legend) for picking out these pieces of information:

- $Weighted\ Crash\ Rate = \frac{\Sigma(\mathrm{K}*25+\mathrm{A}*10+\mathrm{B}*1)*5280*1{,}000{,}000}{\mathrm{No.of\ Years\ of\ Crash\ Analysis\ Period}*\mathrm{Segment\ Length\ (feet)}*365*\mathrm{AADT}}$
- K = Fatal crash frequency
- A = Incapacitating injury crash frequency
- B = Non-incapacitating injury crash frequency
- No. of Years of Crash Analysis Period = 5 years
- Segment Length (ft.) = Length of segment; extracted from the GIS layer
- AADT = annual average daily traffic

Interpreting Curve Data - Start from Top to Bottom

Figure 1 shows the general procedure of the curve analysis. Curve crashes for all roadway types were identified from the police reports, which are coded in Illinois Crash Database 1 as (1) curve level, (2) curve on grade, and (3) curve on hillcrest. Next, curves were ranked based on the sum of weighted KAB crashes that occurred on each curve (weights are in alignment with Illinois' calculations for its Potential for Safety Improvement (PSI) K = 25, A = 10, and B = 1).

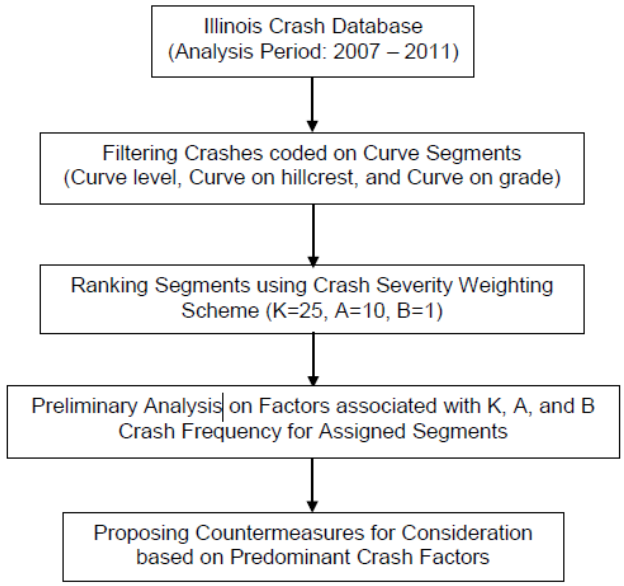


Figure 1: Conceptual Analysis Steps for Curves with Safety Improvement Potential

Curves with the highest sum of weighted KAB injury crash frequency were therefore considered to have the greatest safety improvement potential. The curve crashes can be linked with vehicle and person data, which can be used to identify contributing factors at the time of crash related to the driver, vehicle, and roadway environment. Understanding these contributing factors low-cost site-specific countermeasures were proposed such as chevrons, advance signing, lighting, shoulders and rumble strips should be considered to help negotiate curves and to reduce the frequency and severity of crashes on curves in Illinois. Other treatments such as superelevation correction or high friction surface treatment may be considered as well.

Figure 2 shows a sample GIS map curves with safety improvement potential, as well as matched 2012 Illinois FIVE PERCENT segments. The spatial attributes include: County, Road name, Functional class, and Municipality name. Crash attributes include: the count of crash severity distribution within each curve, crash types, weather condition, and lighting condition

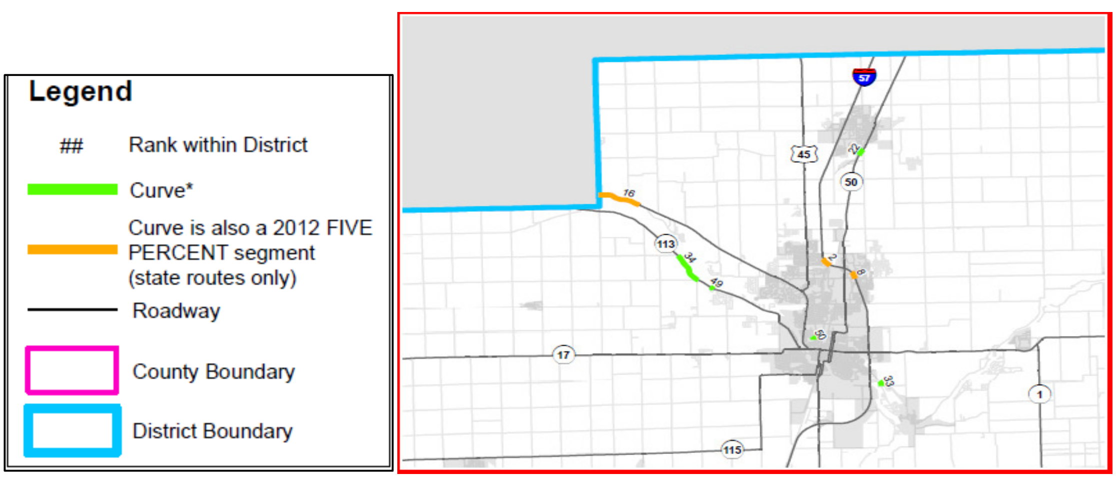


Figure 2. Potential safety improvement curves

Summary

The results from the weighted KAB analysis provides IDOT district engineers an opportunity to review and prioritize high risk curve locations and consider implementing countermeasures or to develop improvement programs. This also allows engineers to proactively evaluate these locations' roadway characteristics (i.e., curve radius and length) and identify other curves on their system with similar features to improve. This approach is an improvement from before when all crash severities were evaluated equally. The ultimate goal for Illinois is to further progress Toward Zero Deaths; addressing critical curves on both the state and local system is one area that will assist Illinois move toward achieving that goal.